

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference WK04-043-PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, Item 5 below.	
International application No. PCT/JP2004/018432	International filing date (day/month/year) 03/12/2004	(Earliest) Priority Date (day/month/year) 24/12/2003
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the International search was carried out on the basis of the International application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☐ **Unity of invention is lacking** (see Box III).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

TRENCH GATE FIELD EFFECT DEVICES

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1

☐ as suggested by the applicant.

☒ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

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International application No.

PCT/JP2004/018432

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

The present invention relates to a technique for reducing the on-voltage of the semiconductor device by increasing the concentration of minority carriers in the deep region (26) and the intermediate region (28). A semiconductor device according to the invention comprises an electrode, a top region (36) of a second conductivity type connected to the electrode, a deep region of the second conductivity type, and an intermediate region of a first conductivity type connected to the electrode. A portion of the intermediate region isolates the top region and the deep region. The semiconductor device further comprises a gate electrode (32) facing the portion of the intermediate region via an insulating layer. The portion facing the gate electrode isolates the top region and the deep region. The semiconductor device according to the invention further comprises a barrier region (40) that is formed within the intermediate region and/or the top region.

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 International Application No
 PCT/JP2004/018432

 A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H01L29/739 H01L29/78 H01L29/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

 Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A X X	US 2002/179968 A1 (PFIRSCH FRANK) 5 December 2002 (2002-12-05) figures 10,19,20 ----- US 5 463 241 A (KUBO ET AL) 31 October 1995 (1995-10-31) figures 16,17 ----- PATENT ABSTRACTS OF JAPAN vol. 1999, no. 01, 29 January 1999 (1999-01-29) -& JP 10 270693 A (TOYOTA CENTRAL RES & DEV LAB INC), 9 October 1998 (1998-10-09) abstract; figure 9 ----- -/--	1,4,5 7-10 1,2,6 1,2,6,14

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

23 February 2005

Date of mailing of the international search report

02/03/2005

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP2004/018432

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 518 629 B1 (KUSHIDA TOMOYOSHI ET AL) 11 February 2003 (2003-02-11) the whole document	1,6,11
X	----- PATENT ABSTRACTS OF JAPAN vol. 1999, no. 02, 26 February 1999 (1999-02-26) -& JP 10 294461 A (TOYOTA CENTRAL RES & DEV LAB INC), 4 November 1998 (1998-11-04) abstract	1,6
A	----- PATENT ABSTRACTS OF JAPAN vol. 1997, no. 03, 31 March 1997 (1997-03-31) -& JP 08 316479 A (MITSUBISHI ELECTRIC CORP), 29 November 1996 (1996-11-29) cited in the application abstract -----	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP2004/018432

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